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Inhalation Studies for Non-human Primates and Rabbits

Strategies For Developing Therapeutics That Directly Target Anthrax and Its Toxins

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10 June 2004

Topics

- **Inhalation system and components**
- **Inhalation system operating parameters**
- **Microbiology support**
- **Factors which can affect the delivered dose**
- **Aerosol exposure experience**

Performing Aerosol Studies

- **Inhalation exposure components**
  - **Inhalation system**
    - **Components**
    - **Operational parameters**
  - **Plethysmography**
    - **Buxco BioSystems XA**
  - **Particle sizing**
    - **Aerodynamic Particle Sizer (APS) spectrometer**

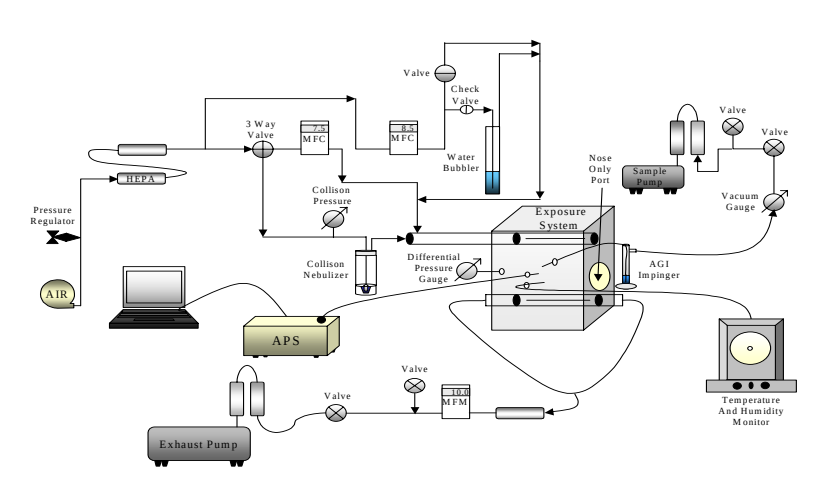
Inhalation System

- **Design and operational parameters modeled after USAMRIID's inhalation exposure system.**
- **Housed within a Class III BSC**
- **Inhalation exposures**
  - **Rabbit – muzzle only**
  - **Monkey – head only**
- **Particle size generation**
  - **1-2 µm**
  - **Liquid suspensions**

Inhalation System Components

- **Inhalation system components**
  - **Collison nebulizer (3-jet) – Generates agent aerosol**
  - **Mixing tube**
  - **Exposure chamber**
  - **Viable particle sampling port: all glass impinger**
  - **Particle sizing sampling port: APS**
  - **Temperature and relative humidity probe**
  - **Bubbler – maintains humidity**
  - **Exhaust**

Diagram of Inhalation Exposure System



Operational Parameters

- House air pressure - ~30 psi
- Collision 3-jet nebulizer
  - 1-2 µm particle size
  - Flow rate - 7.5 lpm (Sierra mass flow controller)
  - Head-pressure - ~ 25-28 psi (Collison dependent)
- Dilution air
  - 8.5 lpm (Sierra mass flow controller)
  - 16 L total flow through system
- Exposure chamber
  - Pressure ~ 0 to –0.2 in Hg, measured using a Magnehelic
  - Volume = 0.56 cubic feet or 15.8 L
  - The neg. pressure maintains constant flow through chamber

Operational Parameters

- Viable sample collection
  - All glass Impinger (AGI model 7541, Ace Glass) - sample rate of 6 lpm (critical orifice)
  - Vacuum pressure - ≥17 in Hg (vacuum gauge)
- Particle size collection (APS)
  - Sample rate of 1 lpm (for 30 sec), 0.5 lpm with diluter (critical orifice)
- Exhaust
  - ~ 10 – 11 lpm

System Checks

- Mass flow controllers – flow calibrated
- AGI – flow calibrated with bubble meter (Buck or Gillibrator) prior to use
- Temp./RH probe - calibrated
- Bubble meter – calibrated
- Buxco XA – calibrated with gas-tight syringe prior to use
- APS – particle size check with NIST Traceable PSL beads
- Aerosol system balanced prior to use – check list